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None

(58) Field of search
B8N
Selected US specifications from IPC sub-class G01F

(54) **Dispensing metered doses of liquid or powder**

(57) An apparatus for automatically filling a liquid or powder into a receptacle consists of an air cylinder simultaneously controlling an infeed valve (46) placed within an exit port (42) of a hopper (28) and a discharge valve (50) placed below the infeed valve within a cavity of a barrel (44). The infeed valve (46) opens after the discharge valve (50) closes allowing the product to enter the cavity of the barrel. When the infeed valve fully closes the discharge valve opens allowing air forced through a piston (34) to push the product via (18) into the receptacle. For a powder, air from nozzle (64) may fluidize the powder and push it into barrel (44). For a liquid, a rising ball valve in piston (34) prevents liquid rising into the hollow stem of the piston; in this case air nozzle (64) is not used. Screw arrangement (17, 35) alters the volume of barrel (44), and thus the amount dispensed.

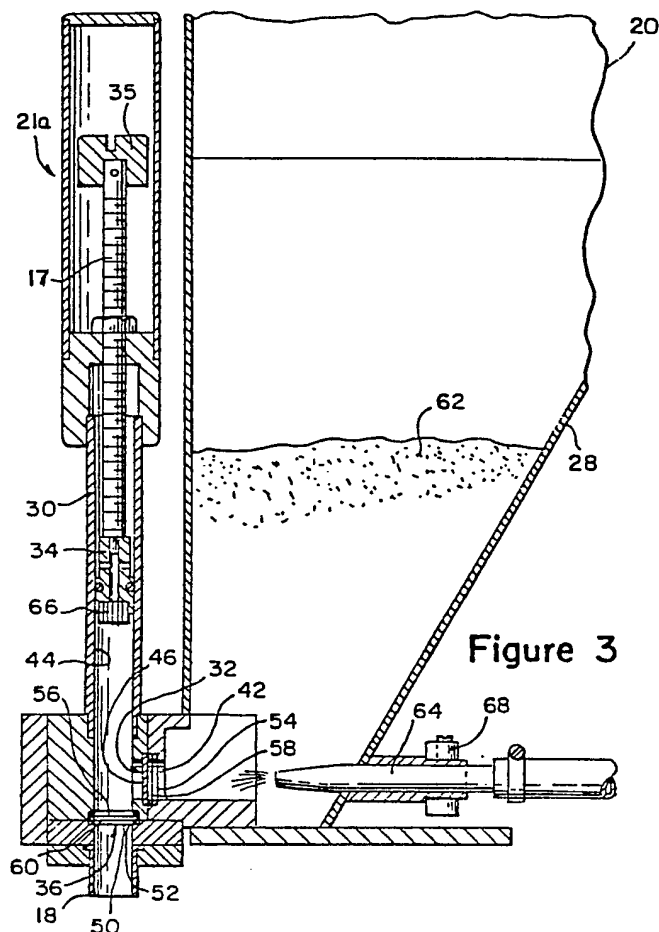
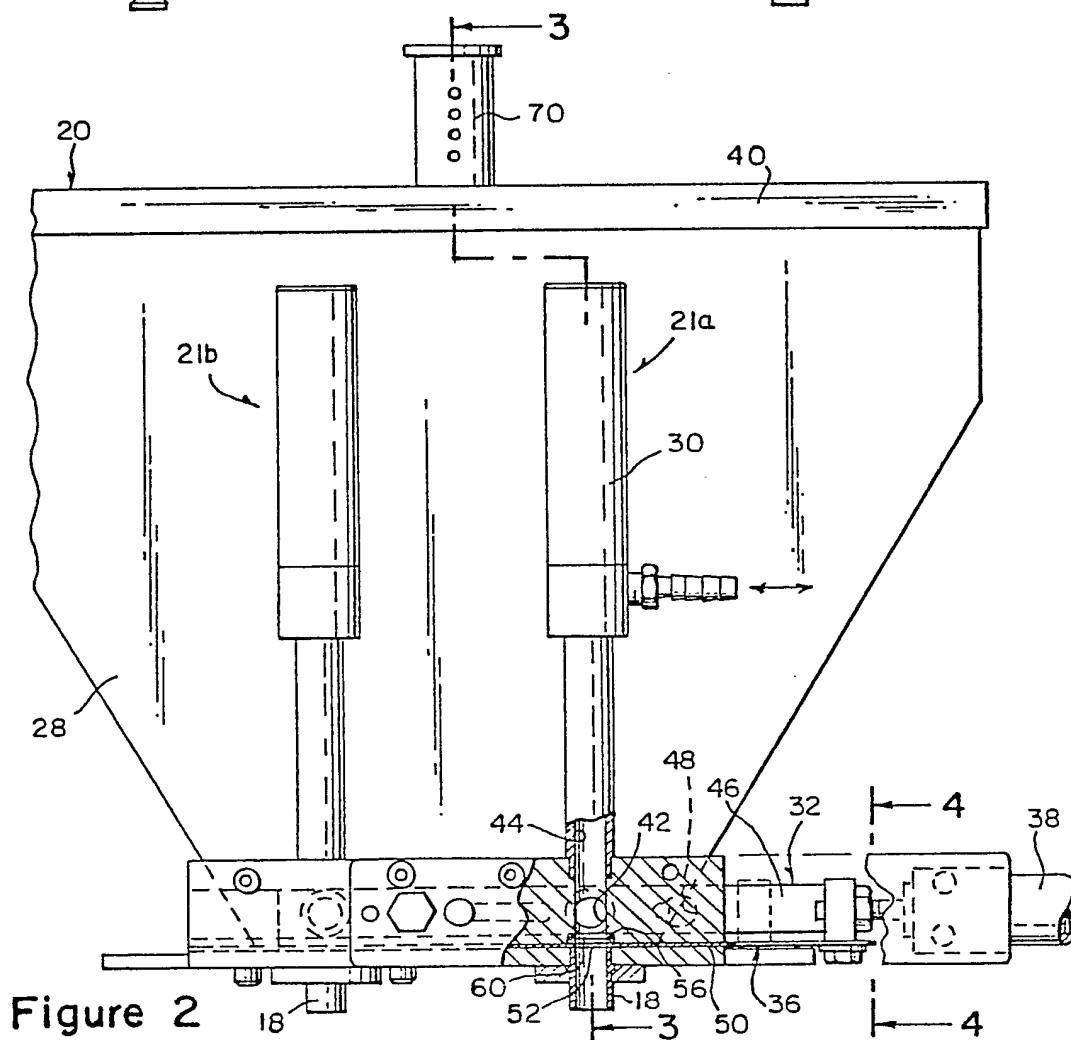
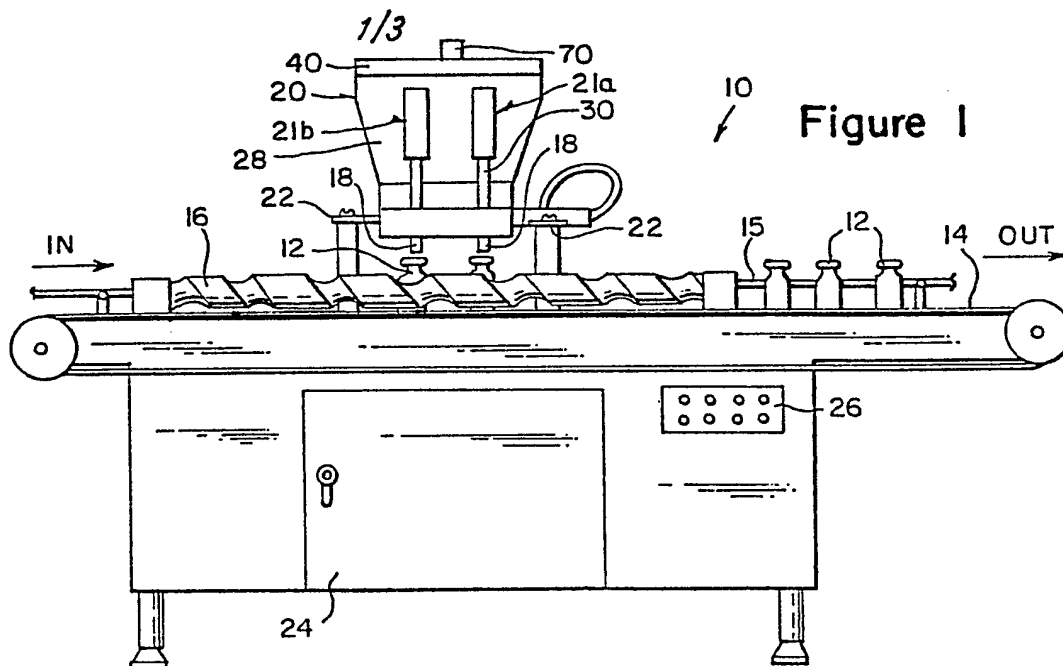


Figure 3



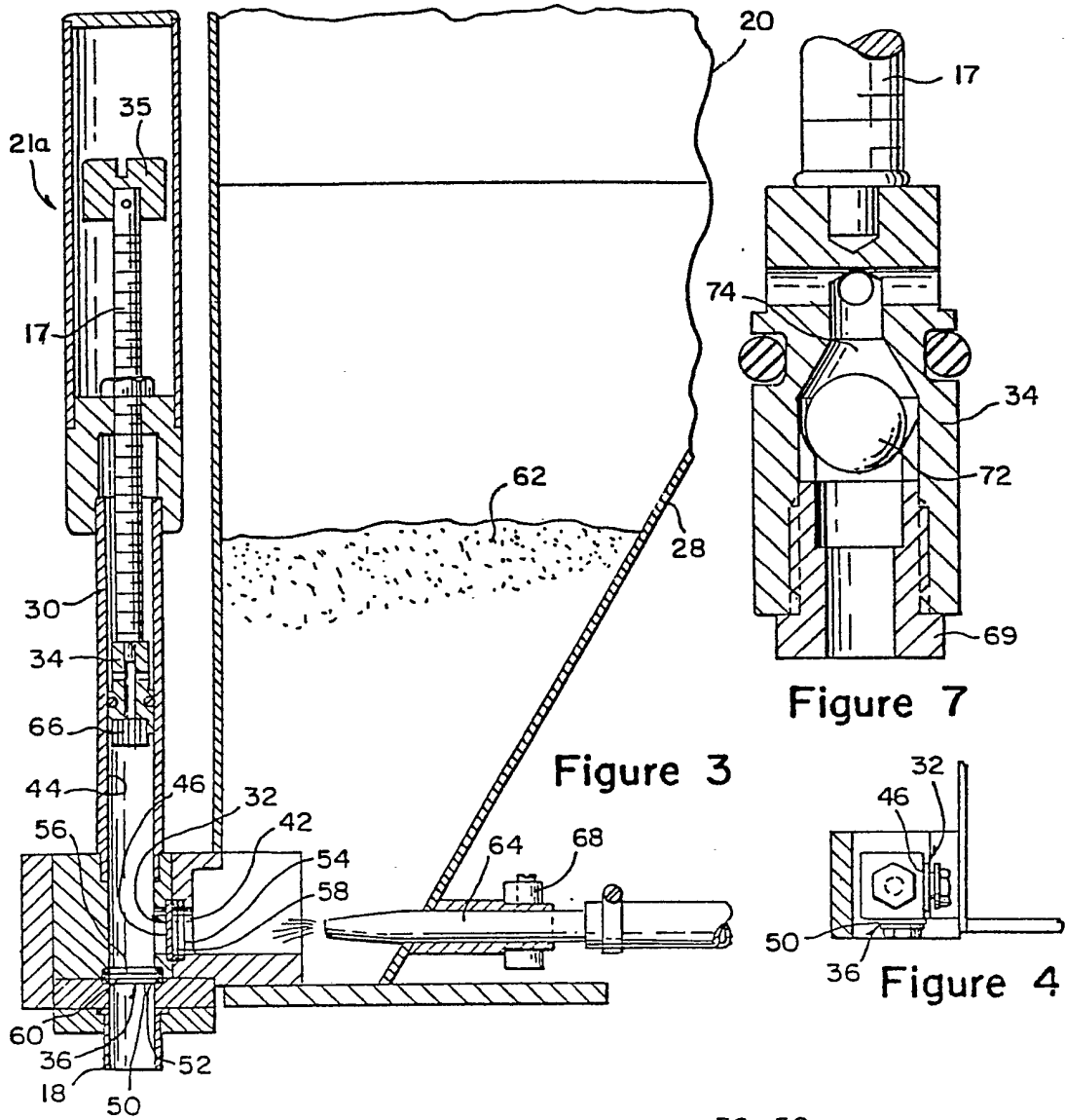


Figure 7

Figure 3

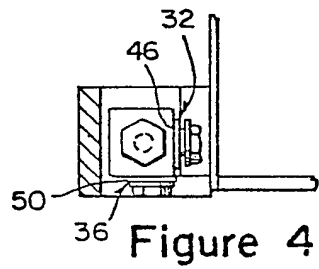


Figure 4

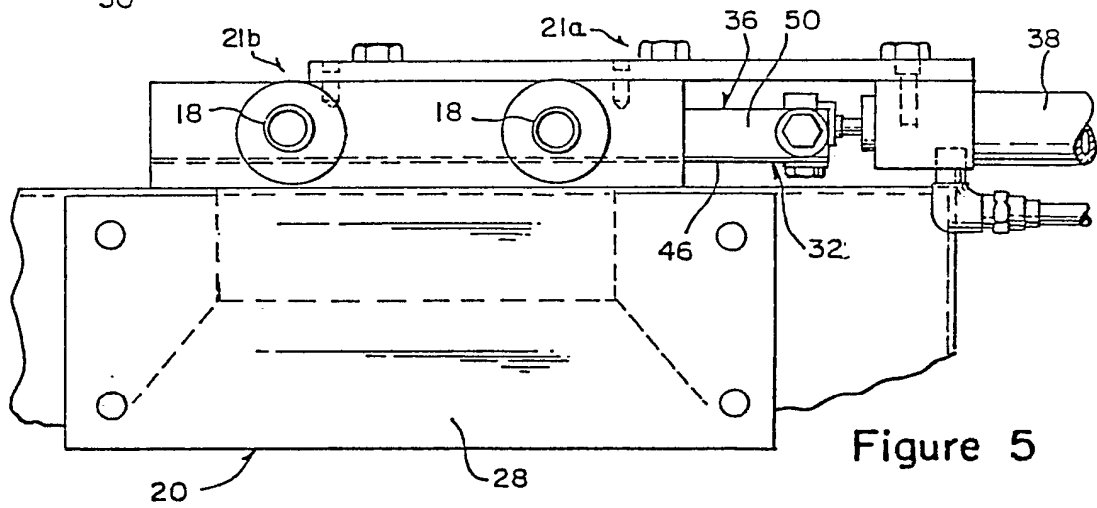


Figure 5

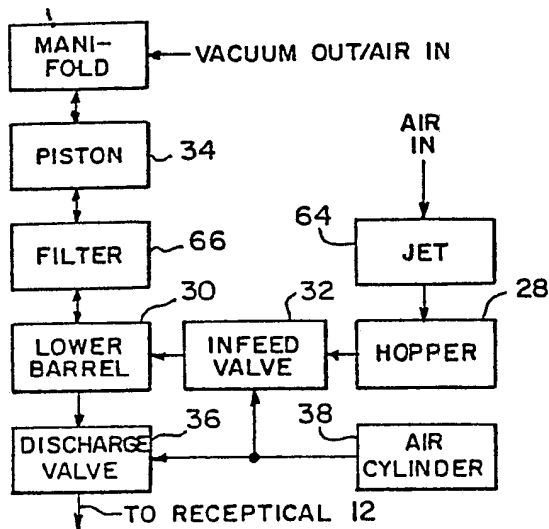


Figure 6

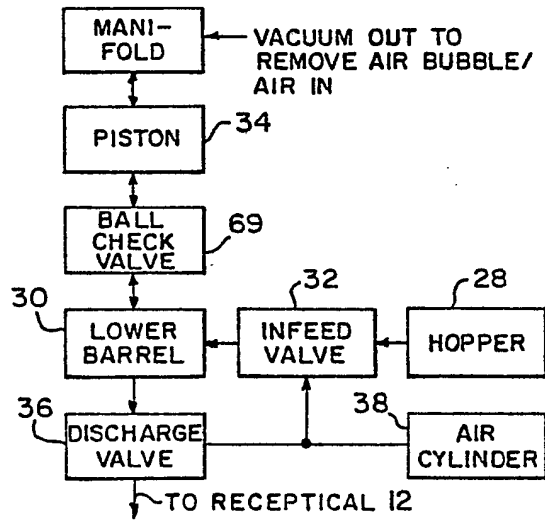


Figure 8

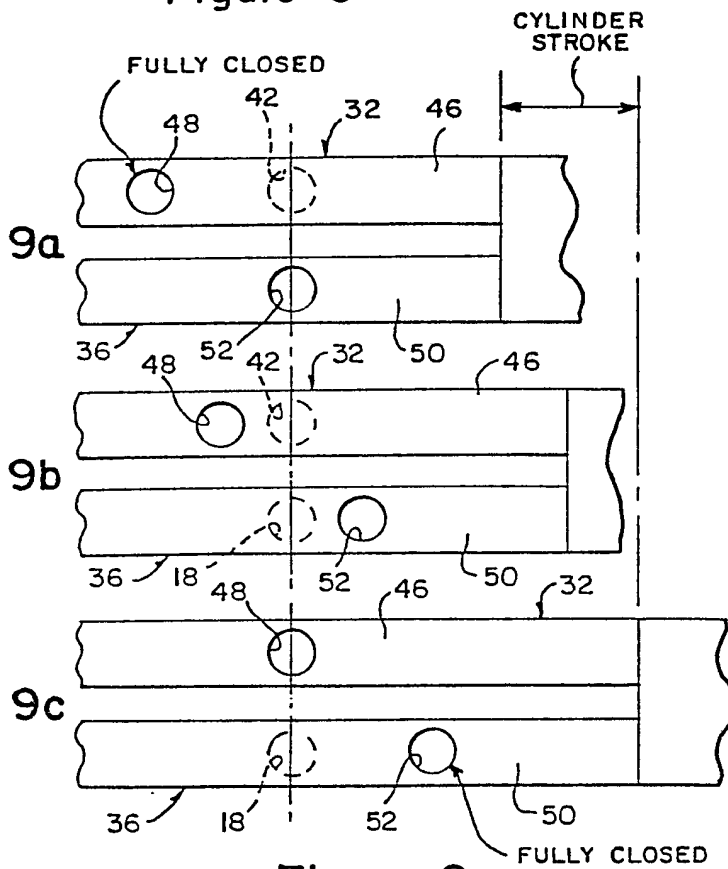


Figure 9

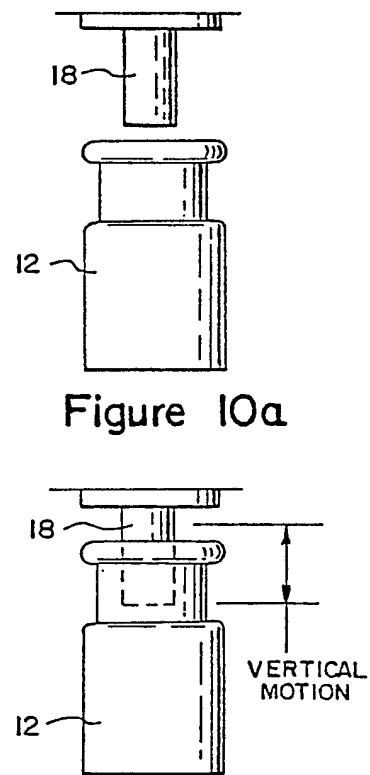


Figure 10a

Figure 10b

SPECIFICATION

Apparatus for automatically filling a product into a receptical**BACKGROUND OF THE INVENTION***Field of Invention*

The instant invention relates generally to automatic powder and liquid filling machines and more specifically it relates to an apparatus for automatically filling a product into a receptical.

Description of the Prior Art

Numerous machines have been provided in prior art that are adapted to fill containers with powder and liquid. For example PERRY ACCOFIL[®]. Models E-1200 and H-1200 automatic powder fillers are designed to only fill powders or granules into containers. PERRY model LF automatic liquid filling machine is designed to only fill liquids into containers. These are separate machines that cannot be converted to switch from powder to liquid and vice versa while these units may be suitable for the particular purpose to which they address, they would not be suitable for the purposes of the present invention as heretofore described.

SUMMARY OF THE INVENTION

A principle object of the present invention is to provide an apparatus for automatically filling a product into a receptical whereby the product can be either a powder or a liquid.

Another object is to provide an apparatus for automatically filling a product into a receptical so that by changing a few parts within the same apparatus the product can be switched from a powder to a liquid.

An additional object is to provide an apparatus for automatically filling a product into a receptical that utilizes a single air cylinder to simultaneously control an infeed valve and a discharge valve so that when one valve is open the other is closed.

A further object is to provide an apparatus for automatically filling a product into a receptical that is simple and easy to use.

A still further object is to provide an apparatus for automatically filling a product into a receptical that is economical in cost to manufacture.

Further objects of the invention will appear as the description proceeds.

To the accomplishment of the above and related objects, this invention may be embodied in the form illustrated in the accompanying drawings, attention being called to the fact, however, that the drawings are illustrative only, and that changes may be made in the specific construction illustrated and described within the scope of the appended claims.

BRIEF DESCRIPTION OF THE DRAWING FIG-**URES**

Figure 1 is a front view of the invention connected to a complete machine.

Figure 2 is an enlarged front view partly in section of the invention.

Figure 3 is a cross sectional view taken along line 3-3 in Fig. 2.

Figure 4 is a cross sectional view taken along line 4-4 in Fig. 2.

Figure 5 is a bottom of Fig. 2 thereof.

Figure 6 is a block diagram of the powder unit.

Figure 7 is an enlarged cross sectional view of part of a piston used in a liquid unit.

Figure 8 is a block diagram of the liquid unit.

Figure 9 is a diagrammatic plan view of both the infeed valve and the discharge valve in various positions showing how the offset works.

Figure 10a is a partial elevational view of the discharge nozzle in an up position in relationship to the recepticle.

Figure 10b is a partial elevational view of the discharge nozzle in a down position in relationship to the recepticle.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Turning now descriptively to the drawings, in which similar reference characters denote similar elements throughout the several views, Fig. 1 illustrates an apparatus 10 for automatically filling a product into a receptical 12. A series of recepticals 12 such as vials, containers, etc., are transported on a conveyer belt 14 and guide rail 15 into an intermittent control device 16 such as a feed screw. A star wheel or fingers can also be used. The recepticals 12 are stopped either singularly or in multiples under one or more discharge nozzles 18 which dispenses the product into the recepticals 12 with one or more doses. The discharge nozzles 18 are part of a filling head 20 that is affixed to the apparatus 10 by mounting brackets 22. The filling head 20 has a vertical movement for the purpose of inserting the discharge nozzles 18 into the recepticals 12 just before dosing (see Figs. 10a and 10b). A control panel cabinet 24 and push button station 26 is also provided.

Figs. 2 through 5 illustrates the filling head 20 in greater detail. The filling head 20 consists of a hopper 28, two vertical barrels 30, two infeed valve orifices 32, two pistons 34, two discharge valve orifices 36 and one air cylinder 38. In describing the filling head 20 only one feed system 21a is described. The other feed system 21b is exactly of the same structure. The product enters the hopper 28 when a top cover 40 is removed. The top cover 40 has an air pressure relief valve 70. The hopper 28 has a horizontal exit port 42 at the bottom. The vertical barrel 30 has a cavity 44 transversely connected to the exit

port 42 of the hopper 28. The infeed valve 32 is placed within the exit port 42 of the hopper. The piston 34 is placed above the infeed valve 32 within the cavity 44 of the barrel 30. The discharge valve 36 is placed below the infeed valve 32 within the cavity 44 of the barrel 30.

The air cylinder 38 simultaneously controls the infeed valve 32 and the discharge valve 36 so that the infeed valve 32 opens after the discharge valve 36 is fully closed allowing the product to enter the cavity 44 of the barrel 30. When the infeed valve 32 fully closes the discharge valve 36 opens allowing air forced through the piston 34 to push the product into the receptacle 12.

The infeed valve 32 is a vertical slide plate 46 that has an infeed aperture 48 therethrough. The discharge valve 36 is a horizontal slide plate 50 that has a discharge aperture 52 therethrough offset from the infeed aperture 48 in the vertical slide plate 46. The offset is spaced so that both infeed and discharge apertures 48 and 52 are totally closed before either aperture is opened, see Fig. 9b. When the discharge valve 36 fully closes the infeed valve 32 opens (see Fig. 9c) and when the infeed valve 32 fully closes the discharge valve 36 opens (see Fig. 9a). Either valve opens only after the other valve closes, that is first one valve closes then the other valve opens and vice versa.

The feed system 21a further contains a pair of O-rings 54, 56 and a pair of valve washers 58, 60. The first O-ring 54 is placed within the horizontal exit port 42 of the hopper 28 while the second O-ring 56 is placed within the cavity 44 of the vertical barrel 30. The O-rings 54, 56 prevent leakage of the product. The first valve washer 58 is placed within the horizontal exit port 42 of the hopper 28 between the first O-ring 54 and the vertical slide plate 46 of the infeed valve 32 while the second valve washer 60 is placed within the cavity 44 of the vertical barrel 30 between the second O-ring 56 and the horizontal slide plate 50 of the discharge valve 36. The valve washers 58, 60 prevent friction on the first and second O-rings 54, 56.

If the product being used is a powder 62 a jet 64 and a filter 66 will be used for feed system 21a. The jet 64 is placed transversely within a bottom clamp 68 of the hopper 28 to apply a blast of air when the infeed valve 32 opens to permit the powder 62 to enter into the cavity 44 of the barrel 30. The filter 66 is connected to the piston 34 to permit the air under vacuum pressure within the cavity 44 of the barrel 30 to pass through but not the powder 62 to further suck the powder 62 into the cavity 44 via said open infeed valve 32. After the slide plates 46 and 50 shift dosing as in the conventional manner is accomplished when a blast of air or inert gas is blown back thru the filter 66 in the piston

34 to push out the powder 62 thru the feed nozzle 18.

The jet 64 serves two purposes, one to fluidize the powder 62 in the hopper 28 with a low pressure flow of inert gas, and secondly to apply a blast when the infeed valve 32 is opened to permit the powder 62 to enter into the cavity 44 of the barrel 30.

An automatic timing control system of any number of manufacturers is used to time the sequence of operation of, jet blast, suction pressure, valve opening and closing, etc.

The unique features in this design is the use of the air jet 64 to blow the powder 62 into the empty cavity 44, while simultaneously sucking out the air from the cavity 44 using a vacuum pressure. The second feature is the use of the slide plates 46 and 50 operated by the single air cylinder 38. The construction of the slide plates 46 and 50, valve washers 58 and 60 to prevent friction on the O-rings 54 and 56, and the O-rings 54 and 56 to prevent leakage, are additional features in this patent application.

The piston 34 is adjustable in height by an adjustable screw knob 35 mounted on adjustment screw 17 to increase or decrease the size of the dose into the receptacle 12 as shown on the drawings. The apparatus 10 will also require an air or gas pump, a vacuum pump regulator, pressure control and a vacuum control.

Fig. 6 is a block diagram of the feed system 21a or 21b using powder 62. In the first phase of operation the infeed valve 32 is opened while the discharge valve 36 is closed by the air cylinder 38. The jet 64 applies a blast of air into the hopper 28 and through the infeed valve 32 to permit the powder 62 to enter the barrel 30 while vacuum pressure is turned through the piston 34 and filter 66 to further suck the powder 62 into the barrel 30. In the second phase of operation the infeed valve 32 is closed while the discharge valve 36 is opened by the air cylinder 38. The blast of air from jet 64 is reduced to low pressure to continue fluidizing the powder 62 in the hopper 28. The vacuum pressure is cut off and air pressure is turned on. The powder 62 in the barrel 30 is then expelled through the discharge valve 36 into the receptacle 12. In the third phase of operation a new receptacle 12 is set up in the conventional manner for repeat of the first phase and second phase of operation.

If the product being used is a liquid, the liquid will enter the cavity 44 of the barrel 30 by the flow of gravity. The hopper 28 could also be pressurized to permit the flow of liquid into the cavity 44. The gas jet 64 at the bottom will not be required. The piston 34 will be equipped with a ball check valve 69 (see Fig. 7) which will be open to permit any air bubble to be evacuated. When the product (liquid) reaches ball 72 it will close check

valve orifice 74 to prevent the liquid from passing through the valve 69 into the upper portion of cavity 44. When the cavity 44 under the piston 34 is filled with liquid, the valves 32 and 36 will be shifted to the discharge mode and simultaneously a flow of air will pass thru the check valve 69 and blow the liquid into the receptacle 12.

Fig. 8 is a block diagram of the feed system 21a or 21b using liquid. In the first phase of operation the infeed valve 32 is opened while the discharge valve 36 is closed by the cylinder 38. The liquid will enter the barrel 30 from the hopper 28. In the second phase of operation the infeed valve 32 is closed while the discharge valve 36 is opened by the air cylinder 38. Air pressure is then turned on through the piston 34 and ball check valve 69. The liquid in the barrel 30 is then expelled through the discharge valve 36 into the receptacle 12. In the third phase of operation a new receptacle 12 is set up in the conventional manner for repeat of the first phase and second phase of operation.

While certain novel features of this invention have been shown and described and are pointed out in the annexed claims, it will be understood that various omissions, substitutions and changes in the forms and details of the device illustrated and in its operation can be made by those skilled in the art without departing from the spirit of the invention.

CLAIMS

1. An apparatus for automatically filling a product into a receptacle which comprises:
 - a) a hopper into which product is supplied, said hopper having an exit port;
 - b) a substantially vertical barrel having an input port connected to the exit port of said hopper;
 - c) an infeed valve between the exit port of said hopper and the input port of the barrel;
 - d) a piston upstream of said infeed valve within the cavity of said barrel;
 - e) said barrel having a discharge nozzle;
 - f) a discharge valve in said barrel upstream of the discharge nozzle;
 - g) means providing vacuum pressure; and
 - h) an air cylinder simultaneously controlling said infeed valve and said discharge valve so that said infeed valve opens after said discharge valve is fully closed allowing the product to enter the cavity of said barrel from the hopper while vacuum pressure is applied under the piston, and when said infeed valve fully closes said discharge valve opens to admit air under pressure to force the piston to push the product into the receptacle.
2. An apparatus for automatically filling a product into a receptacle as recited in claim 1, wherein said infeed valve is a vertical slide plate having an infeed aperture therethrough.
3. An apparatus for automatically filling a product into a receptacle as recited in claim 2,

wherein said discharge valve is a horizontal slide plate having a discharge aperture there-through offset from the infeed aperture in said vertical slide plate so that when said discharge valve fully closes said infeed valve opens and when said discharge valve fully opens said infeed valve closes.

4. An apparatus for automatically filling a product into a receptacle as recited in claim 3, that further comprises:

- a) a first and a second O-ring, said first O-ring being at the exit port of said hopper to prevent leakage of the product and said second O-ring being at the cavity of said barrel to prevent leakage of the product; and
- b) a first and a second valve washer, said first valve washer being at the exit port of said hopper between said first O-ring and said vertical slide plate of said infeed valve to prevent friction on said first O-ring and said second valve washer being at the cavity of said barrel between said second O-ring and said horizontal slide plate of said discharge valve to prevent friction on said second O-ring.

5. An apparatus for automatically filling a product into a receptacle as recited in claim 4, wherein the product is a liquid that will enter the cavity of said barrel by the flow of gravity, and wherein the apparatus further comprises a ball check valve connected to said piston and the piston has a through opening controlled by said valve, said ball check valve being normally closed to prevent the liquid from going into upper portion of the cavity of said barrel.

6. An apparatus for automatically filling a product into a receptacle as recited in claim 4, wherein the product is a powder, further comprising:

- a) a jet placed transversely adjacent the exit port of said hopper to apply a blast of air when said infeed valve opens to assist the powder entering into the cavity of said barrel; and
- b) a filter connected to said piston to permit the air under vacuum pressure within the cavity of said barrel to pass through, but not the powder, so as to suck the powder into the cavity via said open infeed valve.